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PATENT APPLICATION

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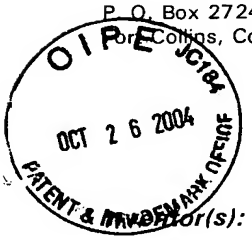

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Mark N. ROBINS and Heather N. BEAN

Confirmation No.: 3023

Application No.: 10/087483

Examiner: Thoi V. Duong

Filing Date: March 1, 2002

Group Art Unit: 2871

Title: DIFFRACTIVE FOCUSING USING MULTIPLE SELECTIVELY LIGHT OPAQUE ELEMENTS

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on *July 26, 2004*.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $340.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

(*X*) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

(*X*)	one month	$110.00
( )	two months	$430.00
( )	three months	$980.00
( )	four months	$1530.00

( ) The extension fee has already been filled in this application.

( ) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account ***08-2025*** the sum of ***$450.00***. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Respectfully submitted,

Mark N. ROBINS and Heather N. BEAN

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10011711-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**
Mark N. ROBINS et al.	
Serial No. 10/087,483	Appeal No.:
Filed: March 1, 2002	Examiner: T. V. Duong
For: DIFFRACTIVE FOCUSING USING MULTIPLE SELECTIVELY LIGHT OPAQUE ELEMENTS	Group Art Unit: 2871
	October 26, 2004

BRIEF ON APPEAL

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

This is an appeal from the final rejection of claims 26-49 of the above-identified application, which claims were finally rejected in the Office action dated March 24, 2004. A Notice of Appeal was timely filed on July 26, 2004. A one-month extension of time for filing a brief on appeal is requested, from September 26, 2004 to October 26, 2004.

10/27/2004 RFEKADU1 00000095 082025 10087483

01 FC:1251 110.00 DA
02 FC:1402 340.00 DA

REAL PARTY IN INTEREST

The real party in interest in this case is Hewlett-Packard Company of Palo Alto, California.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the present appeal.

STATUS OF THE CLAIMS

Claims 26-49 are pending in the application and stand finally rejected. Claims 1-25 have been cancelled. Claims 26, 33 and 39 constitute the independent claims on appeal. This appeal is directed to claims 26-49.

STATUS OF AMENDMENTS

No proposed amendment after final rejection has been filed in the application.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 26 defines a diffractive focusing device for focusing light from a subject onto a focal plane located at a defined distance from the device (e.g., distance D shown in Fig.

1). The device includes a light transmissive substrate (element 105, Fig. 1), and a plurality of selectively light opaque elements supported by the light transmissive substrate (elements 112, Fig. 1) and being controlled to form a focusing diffraction grating pattern of light transmissive channels separated by light opaque regions (activated elements 112 of Fig. 1), with the focusing grating pattern having variable spacing between successive light transmission channels that varies as a function of the defined distance between the device and the focal plane (see page 4, paragraph 0014; page 5, paragraph 0017).

The subject matter of independent claim 33 is directed to a diffractive focusing apparatus, which includes the device as set forth in claim 26, and which further includes a corrective device (pages 6-7, paragraphs 0020-0022) positioned coaxially with the focusing device (e.g., a second focusing device 100 as shown in Fig. 1 coaxially located with a first device 100).

Independent claim 39 is directed to an image capturing device (element 400, Fig. 4), which includes an image sensor (element 425, Fig. 4) and a focusing device (element 412), which corresponds to the focusing device as set forth in claim 26 (and thus which is described at the same paragraphs and figures as set forth above for claim 26).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

This appeal presents the following issues for decision by the Board:

1) Whether claims 26, 27, 31-34 and 38 are unpatentable under 35 U.S.C. § 103 as being obvious over Popovich et al., U.S. Patent No. 6,687,030 ("Popovich") in view of Taniguchi et al., U.S. Patent No. 6,445,406 ("Taniguchi") and are properly rejected on that basis;

2) Whether claims 28, 29, 35 and 36 are unpatentable under 35 U.S.C. § 103 as being obvious over Popovich in view of Taniguchi, and further in view of Oda et al., U.S. Patent No. 6,476,550 ("Oda"),and are properly rejected on that basis;

3) Whether claims 30 and 37 are unpatentable under 35 U.S.C. § 103 as being obvious over Popovich in view of Taniguchi, and further in view of Jepsen et al., U.S. Patent No. 6,172,792 ("Jepsen"),and are properly rejected on that basis;

4) Whether claims 39-44, 48 and 49 are unpatentable under 35 U.S.C. § 103 as being obvious over Popovich in view of Taniguchi, and further in view of Rostoker et al., U.S. Patent No. 5,340,978 ("Rostoker"),and are properly rejected on that basis;

5) Whether claims 45 and 46 are unpatentable under 35 U.S.C. § 103 as being obvious over Popovich in view of Taniguchi

and Rostoker, and further in view of Oda, and are properly rejected on that basis; and

6) Whether claim 47 is unpatentable under 35 U.S.C. § 103 as being obvious over Popovich in view of Taniguchi, and further in view of Rostoker and Jepsen, and are properly rejected on that basis.

ARGUMENT

The Rejection of Claims 26, 27, 31-34 and 38 Is Improper

The invention claimed is directed to a focusing device that uses a diffraction grating pattern to focus light from a subject onto a focal plane, such as onto an image sensor of an image capturing device. For example, the focusing device of the invention would be used instead of a conventional refractive lens apparatus.

None of the prior art references relied upon in the rejection of claims 26, 27, 31-34 and 38 discloses a diffractive focusing device or image capturing apparatus utilizing a diffractive focusing device as claimed.

Contrary to the present invention as recited in the claims, and in particular claim 26, Popovich does not disclose a diffractive focusing device for focusing light from a subject onto a focal plane. Popovich is directed to an apparatus for illuminating a display screen that contains an electronically

generated image displayed thereon. In particular, Popovich discloses apparatus for illuminating a color sequential display, wherein successive monochromatic image components of a final color image are illuminated with corresponding red, green or blue light, in a rapidly switched manner so that an observer effectively sees a full color image. The monochromatic image components are generated on the display by electrical signals from an image control circuit, and are not focused onto the display from a subject.

By definition, focusing light from a subject onto a focal plane results in an image of the subject being projected onto the focal plane. Popovich discloses no such operation. Popovich instead collimates light from a white light source 100 (see Fig. 2) using a collimator 104, and then separates out red, green and blue bandwidth components of the white light with a filter 202. The collimator 104 is in effect the opposite of a focusing device, in that it takes incident light from the white light source 100 and collimates it into a parallel beam 106 of white light.

Similarly, the switchable optics system 208 does not focus light from any subject onto a focal plane. Instead, the system 208 utilizes a switchable holographic optical element as shown in Fig. 11 to perform an illuminating light directing function that directs particular color bandwidth components onto specific areas

of the image display so as to selectively illuminate sequential monochromatic images with corresponding red, green or blue light to obtain a composite full color image by rapid switching of displayed monochromatic images.

Significantly, Popovich discloses that the switchable holographic optical element functions in an active state to diffract a particular bandwidth component of collimated incident light while passing the other two bandwidth components without alteration, and functions in an inactive state to transmit all components without alteration (see col. 2, ll. 18-24; col. 10, l. 52- col. 11, l. 6; col. 11, ll. 19-30). Contrary to the requirements of claim 26, the switchable holographic optical element of Popovich does not operate to be either selectively light transmissive or selectively light opaque, but instead is transmissive at all times. The various cycles of the holographic optical element function only to selectively diffract particular bandwidth components, or not. The holographic optical element is never controlled to be selectively light opaque as set forth in the claims.

Taniguchi relates to a stereoscopic image display apparatus having a lenticular lens for redirecting images to different regions, such as the left and right eyes of an observer. Taniguchi is wholly irrelevant to any teaching or use of the Popovich color sequential display, and as such one of ordinary

skill in the art would not have been motivated by Taniguchi to modify the Popovich apparatus as proposed in the Office action.

The proposed modification of Popovich would make no sense to one skilled in the art, because Popovich does not relate to production of stereoscopic images. Further, even if combined as suggested, the resultant apparatus still would not meet the requirements of the claims because Taniguchi fails to cure the fundamental deficiencies of Popovich with respect thereto. The rejection of claims 26, 27, 31-34 and 38 is improper and should be reversed.

Further, the rejection of claims 32 and 33 is separately improper as Popovich neither teaches nor suggests a "corrective device" as set forth in these claims. In particular, it is clear that element 1804 is not positioned substantially coaxially with the alleged "focusing device" 1200 as asserted in the final rejection. According to Popovich, element 1804 is a device that "focuses the illumination lights and corrects chromatic dispersion."

The Rejection of Claims 28, 29, 35 and 36 Is Improper

The Office action further proposes to modify Popovich with "the teaching" of Oda to reject claims 28, 29, 35 and 36. This ground of rejection is improper and should be reversed.

Oda is directed to an organic electroluminescent device that includes a diffraction grating or zone plate (see Fig. 6), which is formed at a location where the diffraction grating suppresses total reflection at an interface of the electroluminescent device. The zone plate or diffraction grating does not focus light and is not used to focus light onto any focal plane. Consequently, no combination of Popovich with Oda could result in the invention that is set forth in these claims.

The Rejection of Claims 30 and 37 Is Improper

The final rejection further proposes to modify Popovich according to "the teaching" of Jepsen "by forming a plurality of selectively light opaque elements substantially flush with an exterior surface of a substrate so as to create and modulate highly efficient diffraction gratings. This ground of rejection is improper and should be reversed.

Jepsen is directed to a diffraction grating that is used for redirecting light, as shown in Figs. 1a and 1b, such as light from a color display. The diffraction grating does not focus incident light onto a focal plane, but simply redirects the light to another direction, as shown. The light is focused on the grating itself. Consequently, no combination of Jepsen with Popovich could result in the invention as set forth in claims 30 and 37.

The Rejection of Claims 39-44, 48 and 49 Is Improper

The Office action further proposes to modify the Popovich display to include an image sensor, allegedly as suggested by Rostoker et al. This proposed modification also is respectfully submitted to be unobvious, since it would solve no problem and accomplish no purpose. In particular, there would be no need to employ any image sensor with the display of Popovich "for providing a complete representation of the incident image" as alleged in the Office action, because the Popovich display is not an image capturing device. Popovich already provides a complete representation of the image generated on the display, and thus there is no need for any image sensor. As such, it is apparent that the only suggestion for making such a combination has come from a hindsight reading of the present application, and therefore this ground of rejection is not properly supported under 35 U.S.C. § 103, and should be reversed.

The Rejection of Claims 45 and 46 Is Improper

The final Office action proposes to combine Rostoker and Oda with the proposed combination of Popovich and Taniguchi to reject claims 45 and 46. This ground of rejection is improper and should be reversed, as neither Rostoker nor Oda, nor any possible combination of the two, cures the basic deficiency of the

proposed combination of Popovich and Taniguchi, with respect to claims 45 and 46. Reversal of this ground of rejection is urged.

The Rejection of Claim 47 Is Improper

The final Office action proposes to combine Rostoker and Jepsen with the proposed combination of Popovich and Taniguchi to reject claim 47. This ground of rejection is improper and should be reversed, as neither Rostoker nor Jepsen, nor any possible combination of the two, cures the basic deficiency of the proposed combination of Popovich and Taniguchi, with respect to claim 47. Reversal of this ground of rejection is urged.

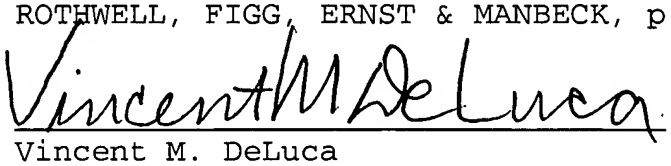
CONCLUSION

In view of the foregoing, claims 26-49 are submitted to be directed to a new and unobvious diffractive focusing device and focus apparatus using such device, which is not taught by the prior art. The Honorable Board is respectfully requested to reverse all grounds of rejection and to direct the passage of this application to issue.

Please charge any fee or credit any overpayment pursuant to 37 CFR 1.16 or 1.17 to Deposit Account No. 08-2025.

Respectfully submitted,

ROTHWELL, FIGG, ERNST & MANBECK, p.c.

By 

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APPENDIX OF CLAIMS ON APPEAL

26. A diffractive focusing device for focusing light from a subject onto a focal plane located a distance D from said device, comprising:

a light transmissive substrate;

a plurality of selectively light opaque elements supported by said light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive;

said plurality of selectively light opaque elements being controlled to form a focusing diffraction grating pattern of light transmissive channels separated by light opaque regions, said focusing diffraction grating pattern having a variable spacing between successive light transmissive channels, which spacing varies as a function of D, such that light from said subject passing through said focusing device is focused onto said focal plane.

27. The device of claim 26, wherein said plurality of selectively light opaque elements are comprised of liquid crystal material.

28. The device of claim 26, wherein said focusing diffraction grating pattern is a concentric plurality of light transmissive rings.

29. The device of claim 28, wherein a spacing Δ between successive light transmissive channels is determined by the following equation:

$$\Delta = [(h + \lambda)2 - D2] \text{ ½}$$

where $h = [r2 + D2]1/2$;
r is the radial distance from the center of said focusing diffraction pattern to the outermost light transmissive channel;
D is the focal distance to said focal plane; and
λ is a wavelength of light incident on said focusing device.

30. The device of claim 26, wherein said plurality of selectively light opaque elements are formed in said substrate so as to be substantially flush with an exterior surface of said substrate.

31. The device of claim 26, wherein said plurality of selectively light opaque elements are formed on said substrate.

32. The device of claim 26, further comprising in combination a corrective diffractive device positioned substantially coaxially with said diffractive focusing device, said corrective diffractive device comprising a light transmissive substrate, a plurality of selectively light opaque elements supported by said

light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive;

said plurality of selectively light opaque elements of said corrective diffractive device being controlled to form a correcting diffraction grating pattern of light transmissive channels separated by light opaque regions, said correcting diffraction grating pattern having a spacing between successive light transmissive channels that is different from the spacing of said focusing diffraction grating pattern.

33. A diffractive focusing apparatus for focusing light from a subject onto a focal plane located a distance D from said device, said apparatus comprising a focusing device including:

a light transmissive substrate;

a plurality of selectively light opaque elements supported by said light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive; said plurality of selectively light opaque elements being controlled to form a focusing diffraction grating pattern of light transmissive channels separated by light opaque regions, said focusing diffraction grating pattern having a variable spacing between successive light transmissive channels, which spacing varies as a function

of D, such that light from said subject passing through said focusing device is focused onto said focal plane; and

a corrective device positioned substantially coaxially with said focusing device, said corrective device including

a light transmissive substrate, a plurality of selectively light opaque elements supported by said light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive;

said plurality of selectively light opaque elements of said corrective device being controlled to form a correcting diffraction grating pattern of light transmissive channels separated by light opaque regions, said correcting diffraction grating pattern having a spacing between successive light transmissive channels that is different from the spacing of said focusing diffraction grating pattern.

34. The apparatus of claim 33, wherein said plurality of selectively light opaque elements of said focusing device are comprised of liquid crystal material.

35. The apparatus of claim 33, wherein said focusing diffraction grating pattern is a concentric plurality of light transmissive rings.

36. The apparatus of claim 35, wherein a spacing Δ between successive light transmissive channels of said focusing device is determined by the following equation:

$$\Delta = [(h + \lambda)2 - D2] \text{ ½}$$

where $h = [r2 + D2]1/2$;
r is the radial distance from the center of said focusing diffraction pattern to the outermost light transmissive channel;
D is the focal distance to said focal plane; and
λ is a wavelength of light incident on said focusing device.

37. The apparatus of claim 33, wherein said plurality of selectively light opaque elements of said focusing device are formed in said substrate so as to be substantially flush with an exterior surface of said substrate.

38. The apparatus of claim 33, wherein said plurality of selectively light opaque elements of said focusing device are formed on said substrate.

39. An image capturing apparatus, comprising:
an image sensor;

a diffractive focusing device for focusing light from a subject onto said image sensor located a distance D from said device, including

a light transmissive substrate;

a plurality of selectively light opaque elements supported by said light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive;

said plurality of selectively light opaque elements being controlled to form a focusing diffraction grating pattern of light transmissive channels separated by light opaque regions, said focusing diffraction grating pattern having a variable spacing between successive light transmissive channels, which spacing varies as a function of D, such that light from said subject passing through said focusing device is focused onto said image sensor.

40. The image capturing apparatus of claim 39, further comprising a shutter between said diffractive focusing device and said image sensor.

41. The image capturing apparatus of claim 39, wherein said image sensor comprises an array of solid state light sensitive elements.

42. The image capturing apparatus of claim 41, wherein said image sensor comprises a CCD array.

43. The image capturing apparatus of claim 39, wherein said image sensor comprises photographic film.

44. The image capturing apparatus of claim 39, wherein said plurality of selectively light opaque elements are comprised of liquid crystal material.

45. The image capturing apparatus of claim 39, wherein said focusing diffraction grating pattern is a concentric plurality of light transmissive rings.

46. The image capturing apparatus of claim 45, wherein a spacing Δ between successive light transmissive channels is determined by the following equation:

$$\Delta = [(h + \lambda)2 - D2] \text{ ½}$$

where $h = [r2 + D2]1/2$;
r is the radial distance from the center of said focusing diffraction pattern to the outermost light transmissive channel;
D is the focal distance to said focal plane; and
λ is a wavelength of light incident on said focusing device.

47. The image capturing apparatus of claim 39, wherein said plurality of selectively light opaque elements are formed in said substrate so as to be substantially flush with an exterior surface of said substrate.

48. The image capturing apparatus of claim 39, wherein said plurality of selectively light opaque elements are formed on said substrate.

49. The image capturing apparatus of claim 39, further comprising in combination a corrective diffractive device positioned substantially coaxially with said diffractive focusing device, said corrective diffractive device comprising a light transmissive substrate, a plurality of selectively light opaque elements supported by said light transmissive substrate and being selectively controlled to be either substantially light opaque or substantially light transmissive;

said plurality of selectively light opaque elements of said corrective diffractive device being controlled to form a correcting diffraction grating pattern of light transmissive channels separated by light opaque regions, said correcting diffraction grating pattern having a spacing between successive light transmissive channels that is different from the spacing of said focusing diffraction grating pattern.